AP Calculus AB Chapter 3.1-3.4 Review Handout #2

1. Using $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ find $f'(x)$ if $f(x)=-\frac{1}{x}$

2. Using $f'(a)=\lim_{x\to a}\frac{f(x)-f(a)}{x-a}$ find $f'(8)$ *if* $f(x)=\sqrt{x+1}$

3. Let $y=\frac{1-x}{x}$

   a) Find the average rate of change of y with respect to x over the interval $[1,4]$.

   b) Find the instantaneous rate of change of y with respect to x at $x = 3$.

   c) Find the value of x for which the instantaneous rate of change equals the average rate of change on $[1,4]$.

4. Find a and b so that $f(x)=\begin{cases}-x^2+4a, & x\le 1\\ 3ax^2-bx, & x>1\end{cases}$ is differentiable at x=1.

5. Find a quadratic polynomial with x-intercept at (1,0) and such that its graph has a tangent line with slope 10 at the point (2,7).

6. If $g(x)=x^3-\sec x$, then $\lim_{h\to 0}\frac{g(x+h)-g(x)}{h}=$

7. Let f and g be differentiable functions such that $f(1)=-2,\ g(1)=2,\ f'(1)=-3,\ g'(1)=-3$

   a.) If $h(x)=2f(x)-3g(x)$, then $h'(1)=$

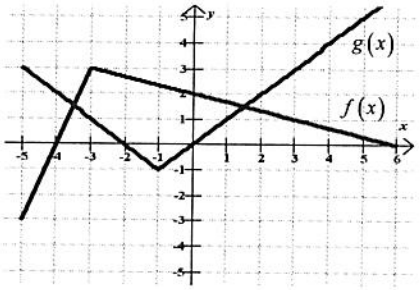
   b.) If $h(x)=f(x)g(x)$, then $h'(1)=$

   c.) If $h(x)=\frac{g(x)}{f(x)+x}$, then $h'(1)=$

8. If $g(x)=\frac{x-2}{x+2}$, then the equation of the tangent line to g at x = 2 is

9. If $p(x)=(x^2-1)(x+k)$ and the line tangent to the graph of p at $x=4$ is parallel to the line $x+y+6=0$, then $k=$?

10. The functions f and g are piecewise linear functions whose graphs are shown below.



a.) If $h(x) = f(x)g(x)$, then $h'(3) =$

b.) If $h(x) = \dfrac{g(x)}{f(x)}$, then $h'(0) =$

c.) If $h(x) = g(2x)$, then $h'(1) =$

d.) If $h(x) = x^2 g(x)$, then $h'(3) =$

11. Find the equation of the tangent line to $y = \dfrac{2}{x}$ that passes through the point (5,0).

12. Find the equations of the normal lines to the graph of $y = \dfrac{-x}{x-1}$ that are parallel to the line $y = 6 - x$.

13. Let f be the function that is given by $f(x) = \dfrac{ax+b}{x^2 - c}$ and that has the properties. Determine the values of a, b, and c.

(i) The function is even (ii) $\lim\limits_{x \to 2^+} f(x) = +\infty$ (iii) $f'(1) = -2$

14. For what x values on the interval $[0, 2\pi)$ does $y = \dfrac{1}{1 - 2\sin x}$ have

a.) A vertical asymptote b.) A horizontal tangent line c.) Equations of the horizontal tangent lines

15. Find $y'(1)$ if $y = \dfrac{1}{\sqrt{x} - 4}$. Then find the equation of the "normal" line to y at x = 1.

16. For what x values will $y = \dfrac{x^2 - 4}{x}$ have tangent lines parallel to the line $10x - y = 3$?

17. Given: $g(x) = f(x)\cos x$ and $f(0) = 2$ *and* $f'(0) = -1$ find the equation of the tangent line to g at x = 0..

18. If the average rate of change of f(x) from x = 1 to x = 5 is 3 and $f(1) = 2$, find $f(5)$.

AP Calculus AB Chapter 3.1-3.4 Review Handout #2 Answers

1. $f'(x) = \frac{1}{x^2}$

2. $f'(8) = \frac{1}{6}$

3. a) $-\frac{1}{4}$ b) $-\frac{1}{9}$ c.) x = -2, 2

4. $a = -\frac{1}{7}$ $b = \frac{8}{7}$

5. $y = 3x^2 - 2x - 1$

6. $\lim_{h \to 0} \frac{g(x+h) - g(x)}{h} = 3x^2 - \sec x \tan x$

7. a.) $h'(1) = 3$ b.) $h'(1) = 0$ c.) $h'(1) = 7$

8. $\frac{1}{4}(x-2) = y$

$k = -6$

10. a.) $h'(3) = 0$ b.) $h'(0) = \frac{1}{2}$ c.) $h'(1) = 2$ d.) $h'(3) = 27$

11. $-\frac{8}{25}(x-5) = y$

12. $-1(x-2) = y+2$

13. a = 0 , b = 9 , c = 4

14. a.) $\frac{\pi}{6}, \frac{5\pi}{6}$ b.) $\frac{\pi}{2}, \frac{3\pi}{2}$ c.) $y = -1$, $y = \frac{1}{3}$

15. $y'(1) = -\frac{1}{18}$ $18(x-1) = y + \frac{1}{3}$

16. $\pm\frac{2}{3}$

17. $-x = y - 2$

18. f (5) = 14